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ABSTRACT

Deficiences in the field of psychological testing associated with the assessment of vocational aptitudes are considered. The rationale for a new approach designed to obviate these deficiences is given. A description of the procedures which provide for implementation of the new approach and the semi-automated Performance Assessment System (PAS) is described in detail. (Author)

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SUMMARY

Deficiences in the field of psychological testing associated with the assessment of vocational aptitudes are considered. The rationale for a new approach designed to obviate these deficiences is given. A description of the procedures which provide for implementation of the new approach and the semi-automated Performance Assessment System (PAS) is described in detail.

RATIONALE FOR AND DEVELOPMENT OF A BATTERY OF PERFORMANCE TESTS FOR VOCATIONAL SELECTION

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More efficient development of human resources depends in part upon placing individuals in vocations for which they are best suited. Horst (1945) held that the development of assessment techniques of greater efficiency would aid immeasurably in the achievement of this goal and stressed that there was a need for procedures that would provide for differential prediction of success for many skilled occupations. As Anastasi (1968) has observed although there are a number of tests designed as multi-aptitude batteries their differential validity is not adequate.

The aptitude tests currently used in occupational selection generally fall into two categories. First, there are the paper and pencil tests which ordinarily are educationally loaded. These tests predict performance in verbal training courses moderately well although they usually correlate relatively low with subsequent job performance. In the other category are tests of simple perceptual motor performance. The performance tests generally predict training and job criteria equally well, however, the job performances they predict are routine and repetitive and therefore are of limited value for many skilled occupations (Ghiselli, 1966).

Many of the tests used for vocational assessment and selection depend greatly upon linguistic skills. Educationally disadvantaged individuals have generally been deficient in verbal skills to such a degree that they have not performed well on such tests. Thus, in many instances, poor test performance may have

reflected an educational deficit rather than an intellectual deficit. The inability to assess the potential for skill acquisition of these individuals has resulted in the misuse of human resources which, in turn, has led to social and economic problems.

Another major problem is the unknown effect on test performance of different degrees and content of cultural experiences. In order to make assessment more precise, tests must be relatively unique in order to minimize the effects of past experience and quantify the same basic capacities over a range of age levels. Such tests if developed, would also eliminate the need for periodic revision resulting from cultural changes.

There is also a need for test stimuli to be of such a nature that problem difficulty levels may be varied in order to permit adequate discrimination among individuals in a number of different population groups without modification of the stimulus characteristics and test format. A battery of tests with maximum utility should also provide for the development of equivalent forms for replication of experimental research as well as retesting of individuals.

In traditional perceptual-motor skill assessment the indices used may have been inappropriate. It may be that an interaction of rate of information processing, short and long-term memory, learning rate, and attentional factors are central to predictive variance. Several investigators have stressed the importance of non-motor characteristics to occupational skills (Parker and Fleishman, 1960; Poulton, 1963). Programming of skilled motor activity is thought to be a function of the capacity for storage and processing of information. Thus skilled motor performance would seem to reflect the capacity of the central nervous system to monitor and organize the ongoing motor activity (Fitts, 1964). It has been noted that human response frequency and accuracy are

not limited by sense organs, muscles or limbs, but rather in central processing where stimulus interpretation and control and activation of the response takes place (Craik, 1948). The capacity and functioning of the central processing mechanism, however, can only be inferred by observation of perceptual-motor test performance.

The principles and hypotheses concerning human performance assessment which gave direction to the development of the battery of tests to be described were derived from the work of a number of investigators. Several studies focused on learning rate and level. Melton (1947) noted that tests which involved complex psychomotor performance and tests that are sensitive indicators of learning were better predictors of success in aircrew selection. Seashore (1951) demonstrated that the initial rate of progress in motor skills is significantly and positively correlated with ultimate performance. Fleishman (1953) emphasized that learning rate should be recognized as a potential predictor in the selection process. Fleishman and Hempel (1953) demonstrated that the basic aptitudes vary in their contribution to success in training, depending upon the level of the learning process. Adams (1957) concluded that the change in rank order from initial to terminal trials on a discrimination reaction time test could be attributed to appitude or capacity of the subjects.

One characteristic which clearly seems related to human performance is the ability to intergrate sensory experiences from a number of modalities. The skilled operator has the capacity for this intergration, which may proceed on a somewhat involuntary basis. In the early stages of skilled acquisition monitoring of proprioceptive feedback is probably supplemented by visual or other sensory inputs. It was suggested by Fleishman and Rich (1963) that individuals who have superior sensitivity to kinesthetic cues should be superior to

others at the advanced stages of learning of a complex motor task but they may not excel during the initial period. Skilled movements of short duration may be regulated continuously by proprioceptive feedback (Gibbs,1954). Hellebrandt (1953) believed that the key to the mastery of a motor skill resides within the act of moving. The individual acquires manipulative skills without being aware of the full complexity of the patterning of afferent sensory impulses. The degree to which automated movement has been acquired and the degree of confidence in this capability may determine the level of skill attained.

In the assessment of motor aptitudes, short-term and long-term memory have often been neglected as predictors of subsequent skill. If perceptual-motor learning is to occur, effective movements (in terms of duration, direction and temporal organization) must be stored for subsequent recall or for comparison of current movement characteristics with stored characteristics which have been perceived as effective (Passey & McLaurin, 1966). Crossman (1964) pointed out that the functions of perception and programming of motor activity are concerned with storing and processing information. That short-term memory is involved in motor skills was shown by Poulton (1963), who found that accuracy over the receptor-effector span was a function of time.

Another potential predictor of perceptual-motor skill which has received little attention is the consistency of performance over trials. Simmonds (1963) found that more experienced pilots showed less variability in instrument flying performance than less experienced pilots. Lewis (1956) found that consistency of performance in automobile driving over a standard course, was a characteristic of skilled but not of relatively skilled drivers. Fitts (1954) hypothesized that the information capacity of motor system could be inferred from the variability of successive responses.

A number of investigators have focused on the need for assessing integrative capacity. Conrad (1951) emphasized the need for integrative and complex behavioral assessment. Fleishman (1953) and Adams (1959) questioned the possibility of accounting for the variance in complex psychomotor tasks by any number of simple motor ability tests. The concurrent nature of perception, information processing and control manipulation in a man-machine system was demonstrated by Jackson (1958). Passey and McLaurin (1966) stressed the necessity of assessing the integrative capacity of intellectual, sensory, and motor behaviors for predicting skilled behaviors and stated that the integration could not be assessed adequately by paper and pencil tests.

Some researchers have commented relative to the underlying processes of capacities involved in various skilled behavior regardless of specific task involved. Fitts (1964) expressed the belief that the capacities which underlie skilled perceptual-motor performance are very similar to those which underlie linguistic skills, problem solving, and concept formation. Gampel (1966) stated that there are no major discontinuities among behavioral systems and that the laws governing their action must be similar, identical or continuous. The typical intelligence test presents a subject with a variety of primarily verbal tasks and thus measures the results of these various capacities in ways which are heavily experientially loaded. However, a performance test which requires the use of the same capacities and for which the appropriate indices have been established also should allow for the quantification of intellectual functioning and minimize the influence of experience.

Although it appears possible to infer level of intellectual function or "intelligence" with appropriately complex and integrative performance tests, the investigators are more interested in predicting future skilled performance. The investigators believe that the level of basic capacities which underlie various

test performances are differentially distributed among individuals and that the pattern of the distribution will allow for accurate prediction of individual success in many skilled occupations.

On the basis of the ideas contained in the foregoing discussion the investigators have developed a series of test with which to assess capacities believed to be fundamental to a wide range of occupations. This series of tests, the Performance Assessment System (PAS), was developed to achieve the following major objectives:

(1) to provide a series of complex and integrative psychomotor tests in order to measure basic capacities such as short- and long-term memory, learning rate, consistency of performance and the integration of intellectual, sensory and motor behaviors.

(2) to provide tests which minimize the effects of linguistic and cultural deficiencies and which are somewhat unique so as to minimize interference effects from past experience.

(3) to provide for adjustment of test difficulty level by modifying the stimulus and response characteristics so that the same test configuration would be appropriate for a number of levels of population capabilities.

(4) to provide tests which would permit the development of equivalent test programs for longitudinal assessment.

Description of the Performance Assessment System

The PAS control console contains a programming unit, a logic system, a paper tape punch (MDS: Model 2110R), response monitoring displays and system controls. A 96 bit photoblock reader (EECO-5112B) reads a prepared punched tape which programs the stimuli and time values through a logic system whose major components are a crystal controlled time base generator, 4 digital timers, 3 storage registers, a multiplexer to convert sequential data to serial data and a tape punch sequencer to

control the operation of the punch. The eight-level punch records the response and time values (to .01 sec), test identification and trials in ASCII format for subsequent computer scoring and data analyses. A cassette recorder transmits test instruction to speakers on the display and response consoles. An intercom system provides for two-way communication between E and S. A diagram of the system concept is shown in Fig. 1.

Insert Figure 1 about here

Two display and response consoles for the simultaneous testing of two Ss are operated by the programming unit. Each display and response console contains six alphanumeric one-plane projection readouts and four numbered (1 thru 4) horizontally mounted lever switches, one in each corner of the display panel. There are four flush-mounted push buttons numbered 1 thru 4 and one 6 x 7 matrix of lights which, when activated, displays a bar-graph pattern. In addition, the console contains two sets of red and green warning lights. One set is used to indicate the response interval, onset of test trials, and end-of-test signal, while the other set provides for response "feedback" when the nature of the test requires that S be informed of the accuracy of his response.

The primary response panel contains a numerical push-button keyboard, numbered 0-9, push buttons labeled "Record," "Same," "Diff," two buttons labeled "Depress" and a "Step" button for a self-paced test mode. The display and response console is shown in Fig. 2.

Insert Figure 2 about here

Description of Tests

Test 1. Arithmetic Computation (A)

S is required to perform simple addition or subtraction of 2 sets of 1 or 2 digit numbers, enter the answer into the numerical keyboard, and depress the record button. Performance indices are mean response latency and number of correct responses for 20 trials.

Number of Problems: 1 illustrative, 3 practice and 20 test

Display and Response Time: 10 sec   Intertrial interval: 1 sec

Problems:

Practice	Test			
1. 76+24	1. 63+19	6. 45-7	11. 68+6	16. 59+6
2. 94-25	2. 31+58	7. 74-69	12. 95-12	17. 28+9
3. 32-7	3. 52-9	8. 83+9	13. 76+8	18. 26+17
4. 55+7	4. 35-27	9. 25+84	14. 56+55	19. 95-17
	5. 95-9	10. 28-9	15. 82-53	20. 35-16

Test 2. Short-Term Memory, Continuously Changing State (STM-CCS)

S is presented with quasi-random digits each appearing sequentially over five displays and repeated throughout the test. After the presentation of 3 digits, a green light appears four displays back from the current stimulus digit and requires S to enter into the keyboard the number which last appeared in that location. The indices are mean response latency and number of correct responses.

Number of Stimuli Series: 1 illustrative, 1 practice and test which requires 20 responses

Display and Response Time: 4 sec   Intertrial Interval: 1 sec

Stimuli:

Practice	Test		
1. 3	1. 8	9. 8	17. 6
2. 8	2. 4	10. 8	18. 7
3. 4	3. 6	11. 9	19. 5
4. 1	4. 2	12. 7	20. 3
5. 5	5. 7	13. 6	21. 4
6. 2	6. 2	14. 4	22. 8
7. 3	7. 1	15. 3	23. 2
8. 6	8. 3	16. 1	

Test 3. Paired Associate Learning (PAL)

S is presented six triads consisting of a letter and a two-digit number three times in alphabetical order during the learning period. The six letters alone are then presented sequentially in alphabetical order and S enters into the keyboard the number with which the letter was paired and depresses the Record Button. Three groups of six triads are given in each session. The indices are the mean response latency and number of correct responses in 18 trials.

Number of letter-number trials: 1 illustrative, 2 sample, and 3 series of six letter-number trials each, requiring a total of 18 responses

Display Time: 2 sec   Intertrial Interval: 2 sec   Response Time: 4 sec

Stimulus sequence:

Series 1				Series 2				Series 3			
1.	A 19	10.	D 54	1.	A 97	10.	D 85	1.	A 38	10.	D 63
2.	B 72	11.	E 34	2.	B 68	11.	E 12	2.	B 51	11.	E 27
3.	C 67	12.	F 29	3.	C 43	12.	F 37	3.	C 15	12.	F 75
4.	D 54	13.	A 19	4.	D 85	13.	A 97	4.	D [illegible]	13.	A 38
5.	E 34	14.	B 72	5.	E 12	14.	B 68	5.	E 27	14.	B 51
6.	F 29	15.	C 67	6.	F 37	15.	C 43	6.	F 75	15.	C 15
7.	A 19	16.	D 54	7.	A 97	16.	D 85	7.	A 38	16.	D 63
8.	B 72	17.	E 34	8.	B 68	17.	E 12	8.	B 51	17.	E 27
9.	C 67	18.	F 29	9.	C 43	18.	F 37	9.	C 15	18.	F 75

Test 4. Switch Activation (SWA)

Initially S hold down two "home keys" labeled Depress. Then a quasi-random sequence of the digits 1, 2, 3 and 4 is displayed. Each digit is shown with either a green or black background. A green background requires that the correspondingly numbered lever switch be moved upward while a black background requires that the switch be moved downward. When a sequence is displayed S releases one home key, activates the lever switches appropriately in sequence and returns to the home key. The other home key is depressed continuously with the non-preferred hand. Upon release of the home key, the display is deactivated.

Performance indices are mean perception time from the onset of the display to the release of the home key, mean motor time starting from release of the home key through activation of the numbered lever switches and ending with the return to the home key, and number of correct responses in 20 trials.

Number of Problems: 1 il' ..rative, 4 practice and 20 test problems.

Practice problems 2 $\underline{1}$ $\underline{4}$ $\underline{3}$, 4 3 2 $\underline{1}$, $\underline{1}$ 4 3 2, 1 $\underline{3}$ $\underline{2}$ 4

(Underlined numbers indicate a green background requiring a switch-up response).

Display and Response Time: 12 sec Intertrial Interval: None

Test Problems:

1. 1 $\underline{3}$ 4 $\underline{2}$	6. 1 $\underline{4}$ 2 $\underline{3}$	11. 2 3 $\underline{1}$ 4	16. 4 $\underline{3}$ $\underline{1}$ 2
2. $\underline{4}$ 1 3 $\underline{2}$	7. 3 1 $\underline{2}$ $\underline{4}$	12. $\underline{3}$ 2 $\underline{4}$ 1	17. $\underline{2}$ 1 4 $\underline{3}$
3. 3 $\underline{2}$ $\underline{1}$ 4	8. 2 $\underline{1}$ $\underline{3}$ 4	13. 4 2 $\underline{1}$ $\underline{3}$	18. 3 $\underline{1}$ $\underline{4}$ 2
4. $\underline{4}$ 3 1 $\underline{2}$	9. 1 $\underline{3}$ 2 4	14. $\underline{4}$ $\underline{2}$ 3 1	19. 2 $\underline{4}$ $\underline{1}$ 3
5. 2 $\underline{4}$ 3 $\underline{1}$	10. $\underline{4}$ 3 1 $\underline{2}$	15. 3 $\underline{4}$ 2 $\underline{1}$	20. $\underline{1}$ 4 3 $\underline{2}$

Test 5. Complex Short-term Memory (CSTM)

There are five sets of randomized digits 3, 4, 5, 6 and 7 digits in length. The digits in each set are presented sequentially. A trial consists of one set of digits followed by a green light. When the green light is displayed, S is required to add the last three numbers which appeared, enter this sum into the numerical keyboard, and depress the Record button. The indices are the mean response latency, and number of correct responses in 18 trials.

Number of Problems: 2 practice and 18 test problems

Display Time: 2 sec Intertrial Interval: 1 sec Response Time: 6 sec

Problems:

Practice:

1. 4, 3, 9, 7 = 19
2. 7, 4, 3, 2, 9 = 14

Test

1. 3, 9, 8, 4, 7 = 19	10. 3, 5, 9 = 17
2. 7, 8, 6 = 21	11. 3, 7, 6, 9, 4, 8, 7 = 19
3. 6, 9, 3, 8, 6, 9= 23	12. 5, 9, 8, 7 = 24
4. 3, 6, 5, 7 = 18	13. 4, 9, 6, 7, 9, 6 = 22
5. 4, 3, 8, 5, 7, 6, 3, = 16	14. 9, 6, 7, 4, 9, 3, = 16
6. 3, 1, 5, 7, 4 = 16	15. 8, 8, 7, 9, 5, = 21
7. 7, 3, 8, 6, 9, 7 = 22	16. 6, 9, 3, 5, 8, 9, 7 = 24
8. 7, 5, 9, 8, = 22	17. 5, 6, 7, 6, = 19
9. 8, 7, 9, 2, 5, 4, 4 = 13	18. 7, 5, 7, 9, 8, = 24

Test 6. Pattern Memory (PM)

S is presented a bar graph configuration (target pattern) followed by a second pattern (comparison). The comparison pattern may be identical to or different from the target pattern. If it is different one light unit has been added to or subtracted from a vertical bar. S presses either the Same or Diff button indicating whether the comparison pattern is the same as or is different from the target. The index is the number of correct responses in 18 trials.

Number of Problems: 1 illustrative, 3 practice and 18 test problems.

Display Time;Target: 3 sec Intertrial Interval: 2 sec

Display and response time;Comparison pattern: 4 sec

Note: Digits refer to number of units lighted in each matrix column

	Target	Comparison
Practice	1. 435276	435275
	2. 247513	247513
	3. 621736	621736

Test

	Target	Comparison		Target	Comparison
1.	751362	751463	10.	264351	264351
2.	512643	512643	11.	512643	412736
3.	735216	735215	12.	315247	316247
4.	562714	563714	13.	342746	342745
5.	627415	627315	14.	137254	137254
6.	742536	742536	15.	257462	257462
7.	561437	562437	16.	731546	731546
8.	631765	621765	17.	317546	317536
9.	376413	376413	18.	241753	241763

Test 7. Average Estimation (AE)

In this test S is required to estimate the mean of five digits displayed for 3 sec and enter the answer into the numerical keyboard. The indices are the mean response time and the number of correct responses in 20 trials.

Number of Problems: 1 illustrative, 3 practice and 20 test problems

Display Time: 3 sec Intertrial Interval: None Response Time: 4 sec

Problems:

Practice

1. 48292 = 5	1. 79185 = 6	6. 98297 = 7	11. 77245 = 5	16. 98486 = 7
2. 72312 = 3	2. 29388 =6	7. 64136 = 4	12. 68132 = 4	17. 57346 = 5
3. 98544 = 6	3. 34693 = 5	8. 87546 = 6	13. 51694 = 5	18. 58287 = 6
	4. 16571 = 4	9. 93599 = 7	14. 42171 = 3	19. 79135 = 5
	5. 42496 = 5	10. 42446 = 4	15. 75594 = 6	20. 49674 = 6

Test 8. Complex Counting (CC)

S counts and remembers the number of times each of the digits 1, 2, and 3 occurs quasi-randomly. Whenever any one of the digits occurs three times, S enters that number into the keyboard and begins counting that digit again while retaining the frequencies of the other two digits. The index is the number of correct responses.

Number of Problems: Practice: 18 stimuli requiring 6 responses
Test: 63 stimuli requiring 21 responses

Display and Response Time: 3 sec Intertrial Interval: 1 sec

Stimuli Sequence:

Practice

1. 1	7. 1	13. 3
2. 2	8. 3	14. 3
3. 3	8. 3	15. 2
4. 2	9. 1	16. 3
5. 3	10. 1	17. 2
6. 1	12. 2	18. 1

Test

1. 1	10. 2	19. 2	28. 1	37. 3	46. 1	55. 1
2. 3	11. 1	20. 1	29. 3	38. 2	47. 2	56. 3
3. 2	12. 1	21. 3	30. 1	39. 2	48. 3	57. 2
4. 3	13. 3	22. 1	31. 3	40. 1	49. 1	58. 3
5. 3	14. 2	23. 2	32. 2	41. 2	50. 2	59. 1
6. 2	15. 2	24. 1	33. 3	42. 1	51. 2	60. 2
7. 1	16. 3	25. 3	34. 3	43. 1	52. 1	61. 2
8. 3	17. 1	26. 1	35. 1	44. 3	53. 3	62. 3
9. 3	18. 2	27. 2	36. 1	45. 2	54. 2	63. 3

Test 9. Kinesthetic Learning (KL)

Initially, S depresses the two home keys. He is then given four practice trials. Each trial consists of the visual presentation of the 4-digit sequence (1, 4, 2, 3) accompanied by a tone. Upon presentation of the visual stimulus and tone, S releases one home key, presses the four numbered, flush-mounted push buttons in the sequence specified and returns to the home key. The other home key is depressed continuously with the non-preferred hand. In the test trials which follow, S wears opaque goggles which prevent his seeing the display and response console and is required to activate the push buttons in the same sequence as he did in the practice trials using the onset of the tone as a signal to being.

The performance indices are: mean auditory reaction time from the onset of the tone to the release of the home key; mean motor speed starting with the release of the home key, through activation of the numbered push buttons and ending with the return to the home key and the number of correct responses in 20 trials.

Problems: Standard push-button activation sequence of 1, 4, 2, 3. 1 illustrative problem, 3 practice trials without goggles, 20 test trials with goggles.

Display and Response Time: 12 sec Intertrial Interval: None

The tests may be made more or less difficult by changing the number of stimuli, increasing or decreasing the display time, intersignal interval or response time.

Equivalent forms of the tests can be generated by varying the sequence of the stimuli. Most of the tests have a low memory value over relatively short time periods and therefore the same form may be used.

The complete battery of tests may be administered to two Ss simultaneously and requires approximately 1 hr for administration.

The characteristics of the tests and time values for each test have been summarized in Table 1.

Insert Table 1 about here

Computer scoring, error-check and data file updating programs have been developed.

Conclusion

The postulated behavioral functions being assessed by each test are shown in Table 2.

Insert Table 2 about here

It is believed that the comprehensiveness of the complex integrative behaviors assessed by the PAS and the basic nature of these aptitudes, greatly divorced from specific cultural experiences, will enable the prediction of vocational skills over a wide range of occupations with much greater success than presently attainable.

It is recognized th.. only in vocations which require long and expensive training or in vocations which are extremely critical in respect to aptitudes required would the testing of two applicants at a time be practical. It is

further recognized that in many training programs much of the training materials are highly verbal in nature. However, if an applicant can demonstrate the basic aptitudes required for success in an occupation, modification of training programs would be justifiable and advisable.

Preliminary investigations concerning the development of group administration (15 - 20 applicants) of the PAS tests appears to be possible at a reasonable development cost.

An extensive series of studies to evaluate the concurrent and occupational validities and reliabilities of the PAS tests are in progress.

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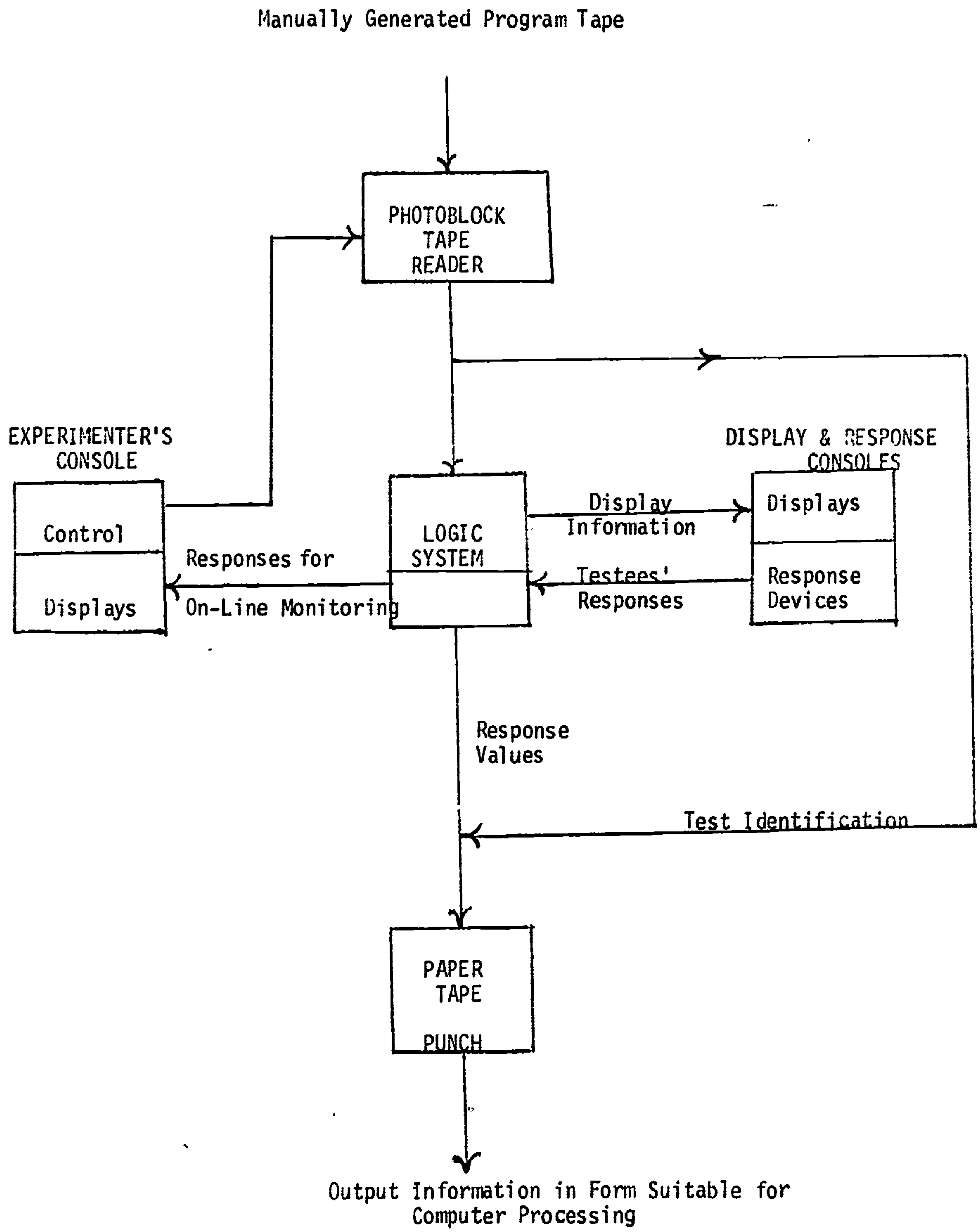

FIGURE 1. CONCEPT OF SYSTEM OPERATION

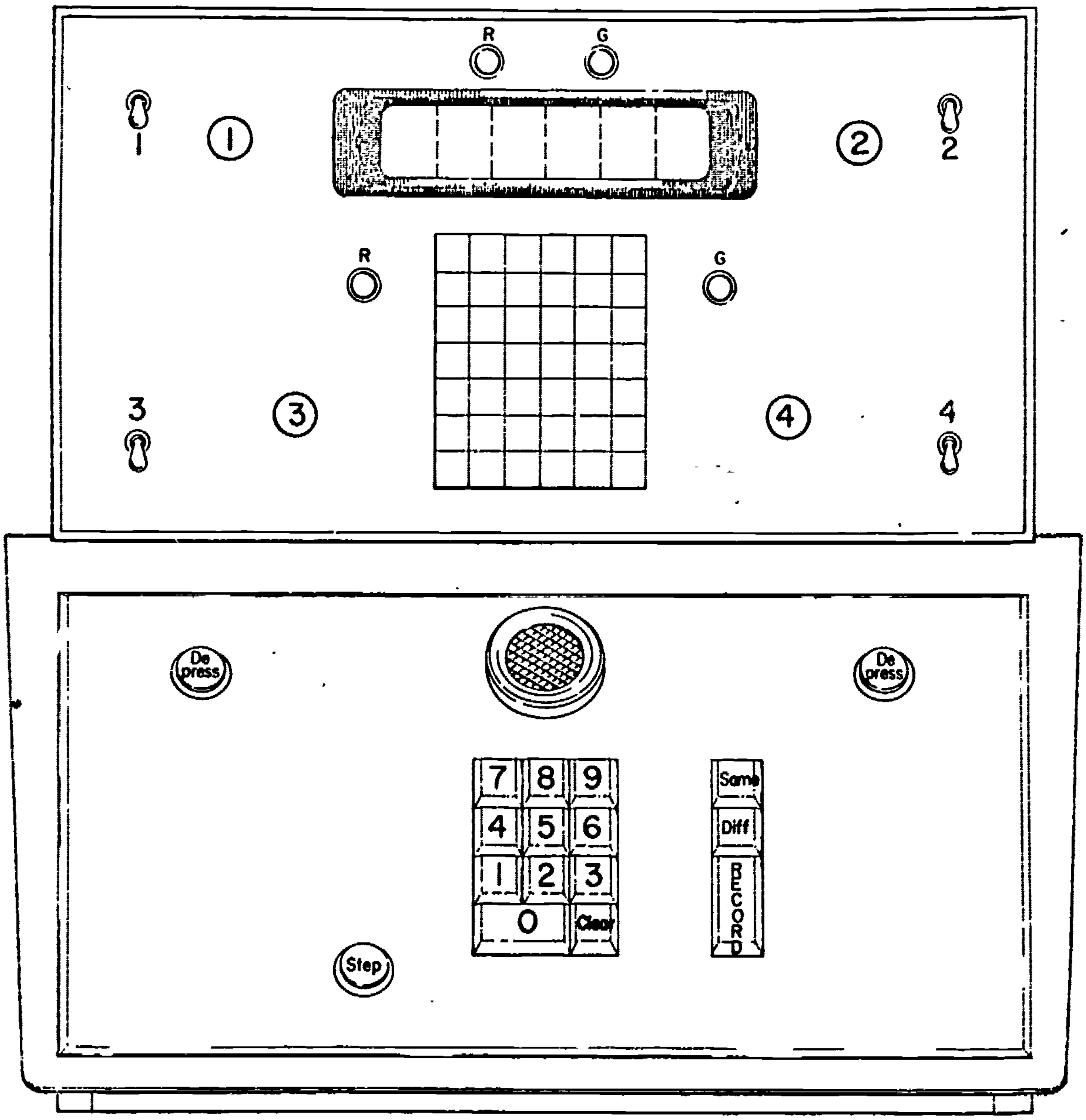

Fig. 3. Performance Assessment System display and response console.

Table 1

Test Characteristics and Performance Test Indices

(Time values in seconds)

Test Name and Number	No. of Practice Trials	No. of Test Trials	Instruction Time	Practice Problem Time	Test Time	Total Time	Performance Indices
1. Arithmetic	3	20	138**	31	213	382	No. Correct, $\overline{X}$ Latency & SD
2. STM Cont. Chang. State*	10	20	26*	71	150	247	No. Correct, $\overline{X}$ Latency
3. Paired Assoc. Learning	2	18	27	23	372	422	No. Correct, $\overline{X}$ Latency
4. Switch Activation*	4	20	77	43	232	352	No. Correct, $\overline{X}$ Perceptual Speed, $\overline{X}$ Motor Speed, & SD's
5. Complex STM	2	18	25	41	443	509	No. Correct, $\overline{X}$ Latency & SD
6. Pattern Memory	3	18	30	35	235	300	No. Correct
7. Avg. Estimation*	3	20	25	24	174	223	No. Correct, $\overline{X}$ Latency
8. Complex Counting	6	21	58	80	352	490	No. Correct
9. Kinesthetic Learning*	3	20	72	32	229	333	No. Correct, $\overline{X}$ Auditory Latency, $\overline{X}$ Motor Speed & SD
		TOTAL	478	380	2400	3258 (54.3 min)	

*Additional indices will be derived based upon differences between mean scores for the first and second halves of the trials.

**Includes familiarization with test signals and purpose of tests

Table 2

Summary of

Performance Tests and Functions Assessed

Performance Test	Functions
1. Arithmetic Computation	Speed and accuracy of information processing involving numbers.
2. Short-Term Memory-Continuously Changing State	Attention, short-term memory and reorganization, spatial relations
3. Paired Associate Learning	Short-term learning, pro-active inhibition
4. Switch Activation	Complex discrete sequential motor skill, perceptual speed, performance consistency, and discrimination reaction time, perceptual motor skill learning
5. Complex Short-Term Memory Processing	Reorganization of short-term memory storage, recall, information processing, and consistency of performance
6. Pattern Memory (Visualization)	Pattern Memory
7. Average Estimation	Perceptual speed and information processing speed
8. Complex Counting	Short-term memory under variable storage load and states
9. Kinesthetic Learning	Speed and accuracy of sequential "blind" positioning movements utilizing pro - prioceptive cues, kinesthetic learning.